DAVIS DAM
Spanning the Colorado River
Kingman vicinity
Mohave
Arizona

HAER AZ-77
AZ-77

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

DAVIS DAM

HAER No. AZ-77

Location:	Spanning the Colorado River Kingman, Mohave County, Arizona. Mohave County, Arizona vicinity Laughlin, Clark County, Nevada vicinity U.S.G.S. Davis Dam, Arizona-Nevada Quadrangle 7.5 Minute Provisional 1983 Davis Dam: 11.0720849.3897925; 11.0721694.3897700 (NAD83) Davis Dam Power Plant: 11.0721169.3897693; 11.07211743897513 (NAD83) Davis Dam 230-kV Switchyard: 11.0721653.3897353; 11.0721461.3897300 (NAD83) Davis Dam 69-kV Switchyard: 11.0721414.3897364 (NAD83) Government Warehouse: 11.0721114.3995974 (NAD83)
Date of Construction:	1942-52
Engineer/Builder:	Bureau of Reclamation engineers designed the dam, power plant, electrical substations, six transmission lines, and the government warehouse. The gauging station and cableway are assumed to have been designed by Bureau of Reclamation engineers. Utah Construction Company engineers designed and constructed the 1942 road, the contractors' camp, the contractors' plant, and the water supply system to the contractors' camp. Utah Construction Company built Davis Dam.
Present Owner:	United States Government, Department of the Interior, Bureau of Reclamation United States Government, Department of Energy, Western Area Power Administration
Present Use:	Electrical generation and transmission, highway transportation, water storage, and flood control
Significance:	Davis Dam was constructed from 1942 to 1952 as the third and final impoundment of the lower Colorado River by the Bureau of Reclamation. Together with Hoover Dam 67 miles upstream and Parker Dam 88 miles downstream, Davis Dam was built to provide flood protection, hydroelectric generation, and water storage for agricultural, industrial, and domestic use in the Southwest. Storage of water behind the dam and the regulation of water flow in the Colorado River below the dam allow the United States to comply with the Mexican Treaty of 1944, particularly annual delivery of 1.5 million acre-feet of water to Mexico in the Colorado River. Davis Dam was the only major dam in which construction included excavation of a new river channel, a portion of which became a through-dam forebay for delivery of water to the power plant and spillway.
Report Prepared By:	Kurt P. Schweigert, Associated Cultural Resource Experts (ACRE) Littleton, CO 80127
Date:	October 2008

I. Description

The Davis Dam Complex consists of Davis Dam and component forebay structure, spillway, power plant, and control building; 230-kilovolt (kV) and 69-kV electrical switchyards; transformer circuit transmission lines and control ducts between the power plant and the switchyards; a warehouse, water tank, and radio tower and building; a river-level gauging station and a cableway; transmission lines originating or terminating in the switchyards; a construction-era road; and ruins of construction facilities. The dam is at the northern end of the complex, and associated structures extend about 1.5 miles downstream or south of the dam on the Arizona and Nevada sides of the Colorado River.

Davis Dam is a rock and earth-fill gravity dam rising 200' above the lowest point of its foundation and 140' above the level of the Colorado River. The dam crest is 1,600' long between the Arizona and Nevada sides of Pyramid Canyon, and the 50' wide dam crest accommodates a convergence of Arizona State Highway 68 and Nevada State Highway 163. Near the eastern end of the dam, a rectangular concrete forebay structure through the dam allows water to flow to the spillway structure at the southern end of the forebay. Water from the forebay also flows through penstocks to the power plant, which is a free-standing structure located to the south of the dam and to the west of the forebay. The highway is carried on a bridge over the upstream end of the forebay. A control building is located to the immediate west of the forebay and to the north of the power plant.

The 230- kV and 69-kV electrical switchyards are located on excavated benches on the Arizona side of the canyon to the southeast of the dam. The 230-kV switchyard includes an upper segment and a lower segment separated by an escarpment, and the 69-kV switchyard is located to the west of the lower portion of the 230-kV switchyard. A concrete control conduit extends from the power plant, through the forebay/spillway gate structure, and eastward to the switchyards. Ten high-voltage transmission lines terminate at the switchyards, and a low-voltage transmission line runs to the south of the 69-kV switchyard to provide power to government facilities downstream. Upslope to the southeast of the switchyards is a large steel water tank, a radio tower, and a radio equipment building.

Downstream to the south of the dam and power plant on the Arizona side of the Colorado River is a large steel warehouse and work area, remnants of two wood-pier bridges used during dam construction, the eastern end of a cableway across the river, and the site of a government construction camp. Downstream from the dam and power plant on the Nevada side of the Colorado River are a river gauging station, the western end of the cableway across the river, a road constructed in 1942 to facilitate dam construction, and concrete foundation remnants of a contractors' camp, a contractors' plant, a penstock fabrication plant, and a water delivery system for the contractors' camp.

II. Authorization and Construction

Davis Dam was the third dam constructed by the U.S. Bureau of Reclamation on the lower Colorado River to provide flood control, hydroelectric generation, and water storage for irrigation, municipal uses, and other uses. As a result of previous devastating floods on the lower Colorado River, several potential dam sites were investigated by the Reclamation Service (later renamed the Bureau of Reclamation) after the passage of the Reclamation Act in 1902. A potential dam site at the lower end of Pyramid Canyon was investigated in 1902-1903, but the site was extremely inaccessible, and the narrowness of the canyon made control and diversion of the river difficult. Completion of Hoover Dam in 1935 about 67 miles upstream allowed the Bureau of Reclamation (hereafter Reclamation) to regulate the flow of the river, thereby providing much more stable conditions for construction of a dam in Pyramid Canyon.[1]

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1 Toni R. Linenberger, "The Parker-Davis Project (Third Draft," Bureau of Reclamation History Program, (1997).

Reclamation initially called the proposed dam Bullshead, in reference to a large rock formation resembling the head of a bull near the lower end of Pyramid Canyon. The Secretary of the Interior authorized construction of the dam on April 26, 1941, under provisions of the Reclamation Project Act of 1939. The project was named the Davis Dam Project in honor of Arthur Powell Davis, who had been Director of Reclamation from 1914 to 1932.

From four potential sites in Pyramid Canyon, the dam location was chosen because: "(a) it had the best spillway location, (b) the canyon rim was higher, (c) a single structure would control both the ancient and present channel, and (d) preliminary designs and estimates indicated the cost would be considerably less than for the other sites."[2]. The final design scheme was that of an "earth- and rockfill dam with a concrete gravity intake and spillway structure placed at the downstream end of a combined diversion and forebay channel;" the prescribed height of the structure ensured a high-water level an elevation of 647', to coincide with the level at the base of Hoover Dam. The arrangement of the dam and appurtenant structures was unusual in that the plan did not follow any of the layouts ordinarily employed in dam construction. The scheme included the digging of a new river channel around a stretch of the existing river, use of the materials excavated from this new channel to dam up the canyon, and the construction of concrete control structures across the newly created channel[3]

Davis Dam was constructed in three phases. The first phase included the excavation of the diversion and forebay channel and completion of the forebay concrete structures to at least elevation 550' above mean sea level prior to initial diversion of the river. Diversion of the river was the beginning of the second phase, which included excavation and de-watering the dam foundation and constructing the dam's earth embankment and finishing the concrete placement operations on the forebay channel structures. The third phase of dam construction consisted primarily of completion of concrete work on the spillway.[4]

On June 25, 1942, the U.S. government awarded a contract for construction of Davis Dam and Powerhouse to the Utah Construction Company of San Francisco, one of the six companies that had constructed Hoover Dam. Even though the United States was at war, Reclamation believed that priority could be obtained for purchase of critical materials and equipment for the dam.[5] Initial work on the Davis Dam Project began in June 1942 with the construction of a railhead near Kingman, Arizona, temporary headquarters of Utah Construction Company near the railhead, improvement of roads to and around the project area, and initial construction of a workers camp and industrial plant downstream from the dam site. An agreement between the Arizona State Highway Department and Utah Construction Company allowed the company to improve an existing eighteen-mile-long road through Union Pass westward from Kingman, Arizona, at the company's expense, and provided for building of the new highway about eight miles long to the river, with the state contributing $50,000 to the new highway project.[6]

Preparatory work for dam construction began on September 12, 1942, including drilling and blasting of rock in the diversion and forebay channel, forebay structures, and powerhouse location. Excavation of materials in these areas continued throughout the remainder of September and most of October 1942. To provide electricity and communications to the dam site, a transmission line was constructed to tie in to an existing line from Hoover Dam to Needles, California, and a link was constructed from a transcontinental telephone line north of the dam site.[7] On October 27, 1942, the War Production Board revoked priority ratings required for obtaining necessary construction

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2 Bureau of Reclamation, "Davis Dam and Powerplant: Technical Record of Design and Construction," United States Department of Interior (1955): 4.
3 Ibid., 53.
4 Ibid., 177.
5 Ibid., 4.
6 Bureau of Reclamation, "Davis Dam Project, Arizona – Nevada, Annual Project Histories." United States Department of Interior (1942): 15.
7 Lindenberger, 1997: 28. Bureau of Reclamation, "Davis Dam Project, Arizona – Nevada, Annual Project Histories," 1942: 21.

materials for the Davis Dam Project, and no further work was undertaken for the duration of World War II. On February 20, 1943, Reclamation formally terminated the contract with the Utah Construction Company for construction of the Davis Dam and Powerhouse.[8]

In 1945, with the war over in Europe and Asia, the federal government resumed its domestic public works program. During the war, the United States had signed and ratified the Mexican Water Treaty, guaranteeing 1.5 million acre-feet of Colorado River water be delivered to Mexico annually. Water storage behind Davis Dam would allow the treaty provisions to be met. On January 15, 1946, Reclamation awarded a new contract to Utah Construction Company, and the company received a notice to proceed on March 22, 1946.[9]

The power plant was initially planned to be located downstream from the dam spillway structure, but explorations below the footing levels revealed the existence of two major fault zones at varying depths under the power plant intake structure locations, and also disclosed the existence of soft rock, crossed by faults, decayed zones, and slip seams, in the spillway area. Consequently, the power plant was relocated upstream from the original planned site, and the intake structure was rotated in a clockwise direction, swinging the north end away from the power plant onto a firmer foundation. Extensive grouting was also done under all the major structures.[10]

In February 1947, the excavation was completed for the river diversion channel, the forebay channel, and foundations for the spillway and intake structures. By the end of 1947, the foundation grouting of these structures was finished, allowing actual construction to begin. Large-scale concrete placing operations began for the spillway and outlet structure in January 1948, and concrete placing for the intake structure began in February 1948. The river was diverted in June 1948; de-watering of the dam site took place over the following three months, and placement of the dam embankment material commenced in September 1948.[11] By April 1949, the dam embankment had reached its completed height. The spillway was completed in October 1950.

Power plant construction paralleled that of the dam. The semi-outdoor type power plant contained Francis-type, 62,200 horsepower turbines and vertical-shaft generators, served by five main power transformers and three single-phase transformers. On January 5, 1951, Reclamation placed Unit 1 of the Davis power plant into service, when, from his office in Washington, D.C., Secretary of Interior Oscar Chapman pressed a telegraph key that transmitted the signal to Davis Dam, energizing power operations. Two weeks later, Unit 2 started for the first time, but its thrust bearings quickly overheated and the equipment failed. Maintenance crews put Unit 2 back into service by mid-April 1951. The remaining three generating units went on line from mid-April to mid-June 1951. The Davis 230-kV switchyard and transmission lines were fully operating facilities by the end of 1951.[12]

The Davis Dam complex was designed with two major electrical switchyards: a 230-kV facility that would serve large transmission lines and interconnect with other Bureau of Reclamation power plants at Hoover Dam and Parker Dam, and a 69-kV switchyard that would interconnect primarily with regional distribution systems. In general, development of the 230kV switchyard design followed the changes that occurred during the development of the power plant design.[13] The location of the 230-kV switchyard was first planned for the Nevada side, but the only feasible site for the large switchyard on the Nevada side was too distant from the power plant. Also dismissed was a site west of the forebay channel, where the utility building and visitor parking lot currently exists. The site finally chosen for the 230-kV switchyard was on the Arizona side of the canyon, to the southeast of the

8 Bureau of Reclamation, "Davis Dam Project, Arizona – Nevada, Annual Project Histories," 1942: vi-vii, 1.
9 Lindenberger, 1997: 29.
10 Bureau of Reclamation, "Davis Dam and Powerplant: Technical Record of Design and Construction," 1955:60.
11 Bureau of Reclamation, "Davis Dam Project, Arizona – Nevada, Annual Project Histories," 1948: 10.
12 Bureau of Reclamation "Davis Dam Project, Arizona – Nevada, Annual Project Histories," 1951: 4, 22, 28-9.
13 Bureau of Reclamation, "Davis Dam and Powerplant: Technical Record of Design and Construction," 1955: 173.

forebay structure; this location provided adequate terrain and space for approach of transmission lines. In part because it was located on the canyon slope, the 230-kV switchyard was designed to have upper and lower levels within a rectangular configuration. The 69-kV switchyard was located on a rock bench, down slope to the northwest of the 230-kV switchyard.

The Utah Construction Company performed the excavation and grading for the switchyard plan, as well as the construction of a concrete control cable tunnel and conduit from the power plant to the switchyards. The firm of Donovan-Wismer-James and Becker completed construction of the 230-kV switchyard in mid-1951. The 69-kV switchyard and transformer circuit were completed by the George E. Miller Company in 1952. In May 1951, Utah Construction Company finished removing all temporary camp and plant buildings. On December 1, 1951, the essential aspects of the Davis Project—the dam, reservoir, and forebay and power plant structures—also were transferred to operations and maintenance status. The following year, many of the smaller project elements, including the dam elevator, outside lighting, utility building, communication facilities, and the forebay channel bridge, were completed and transferred from construction to operations and maintenance status. On December 10, 1952, the Davis Dam and Powerplant was officially dedicated.[14]

III. Post-Construction History

Changes to the dam complex have been minor since its completion.[15] By 2002, the five spillway gates had been rehabilitated, and three generators have been rewound and updated to higher generation capacities.[16] In the 1950s, the area of the original contractor's plant, to the south of the west end of the dam, was developed as a camping area by a sportsmen's association from Las Vegas area in cooperation with the Nevada Fish and Game Commission.[17] The Commission ended this arrangement in 1969, when Reclamation leased the twenty-six-acre parcel to Clark County to operate as a park, known as Sportsmen's Park. A 1992 memorandum reported that the park was in poor shape, facilities needed repair, vandalism occurred frequently, and there were ongoing problems with park drainage and erosion of the surrounding steep slopes.[18] The park closed in 1995, and the county removed its improvements and returned the land to Reclamation on January 1, 1996.

Demographics of the Davis Dam area changed dramatically from the time the dam was completed in 1952 to 2006. Davis Dam still provides a highway crossing of the Colorado River that serves southern Nevada, Arizona, and California, but in 1987 a bridge was completed about two miles downstream from the dam, and Nevada Highway 163 and Arizona Highway 68 were realigned to meet at the new bridge. The new highway bridge was funded by Don Laughlin, who purchased a small hotel downstream from Davis Dam in 1968 and built the town of Laughlin into the third most popular gaming site in Nevada, after Las Vegas and Reno. Laughlin's population was nearly 8,000 persons in 2005, and Bullhead City, on the Arizona side of the river, had an estimated population of nearly 39,000 persons in 2005.[19]

Additional historical information can be found in documentation forms for individual structures and features of the Davis Dam Complex.

IV. Project Information

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14 Bureau of Reclamation, "Davis Dam Project, Arizona – Nevada, Annual Project Histories," 1952: 8.
15 Dames & Moore, "Appendix E Historic Property Inventory Form, Davis Dam Historic District," United States Bureau of Reclamation (1997): 3.
16 Bureau of Reclamation (2002).
17 Robert Autobee, in discussion with Bill Martin, January 28, 2003.
18 Vernon Lovejoy, "Memorandum to George Wallen, regarding trip to Sportsman's Park," April 2, 1992,
19 Laughlin Chamber of Commerce, "Relocation," http://www.laughlinchamber.com; City of Bullhead City, "Welcome to the City of Bullhead City," http://www.bullheadcity.com

This documentation has been prepared at the request of the U.S. Department of Energy, Western Area Power Administration (Western), Phoenix, Arizona to fulfill Western's responsibilities under Section 106 of the National Historic Preservation Act. Davis Dam and associated features have been determined to be eligible for nomination to the National Register of Historic Places as an historic district. Western has considered the effects on cultural resources caused by replacing electrical equipment in the switchyards that have become unreliable due to age. This HAER documentation partially fulfills the Special Conditions of Compliance for Section 106 and the implementing regulations 36 CFR § 800, as specified in a Memorandum of Agreement between Western and the Arizona State Historic Preservation Officer.

This documentation was accomplished by Associated Cultural Resource Experts (ACRE), Denver, Colorado. Kurt P. Schweigert of ACRE was Principal Investigator and prepared the second draft and final documentation packages. Douglas M. Edwards of ACRE was the photographer, and Peggy Beedle of ACRE assisted in field documentation and photography.

Research for this HAER documentation focused on the electrical switchyards within the Davis Dam Complex. Most information was drawn from records, reports, and drawings and specifications held by Western Area Power Administration in Phoenix, Arizona and Denver, Colorado, and from similar documents held by the Bureau of Reclamation in Denver, Colorado; Boulder City, Nevada; and at Davis Dam. Information was also drawn from an intensive cultural resources inventory of Bureau of Reclamation lands at Davis Dam.[20] Research conducted for the current documentation of the electrical switchyards does not provide adequate information for documentation of the engineering character and construction history of the dam structure, power plant, and other features of the complex.

V. Sources

ACRE and HRA Conservation Archaeology. "Intensive Cultural Resource Inventory of Bureau of Reclamation Lands in the Vicinity of Davis Dam, Clark County, Nevada and Mohave County, Arizona." 2005.

Bureau of Reclamation. "Davis Dam Project, Arizona – Nevada, Annual Project Histories." United States Department of Interior, Bureau of Reclamation, 1942-1953

_____. "Davis Dam and Powerplant: Technical Record of Design and Construction." Denver, Colorado: United States Department of Interior, Bureau of Reclamation, 1955.

_____. "Annual Project History, Parker Davis Dam Project." Denver, Colorado: National Archives and Record Administration, 1957-1977.

_____. "Davis Powerplant." http://www.usbr.gov (accessed October 4, 2004).

_____."Parker-Davis Project AZ, CA, and NV." http://dataweb.usbr.gov (accessed November 8, 2005).

City of Bullhead City. "Welcome to the City of Bullhead City." http://www.bullheadcity.com (accessed February 20, 2006).

Dames & Moore. "Appendix E Historic Property Inventory Form, Davis Dam Historic District." On file at U.S. Bureau of Reclamation, Lower Colorado Regional Office, Boulder City, Nevada, 1997.

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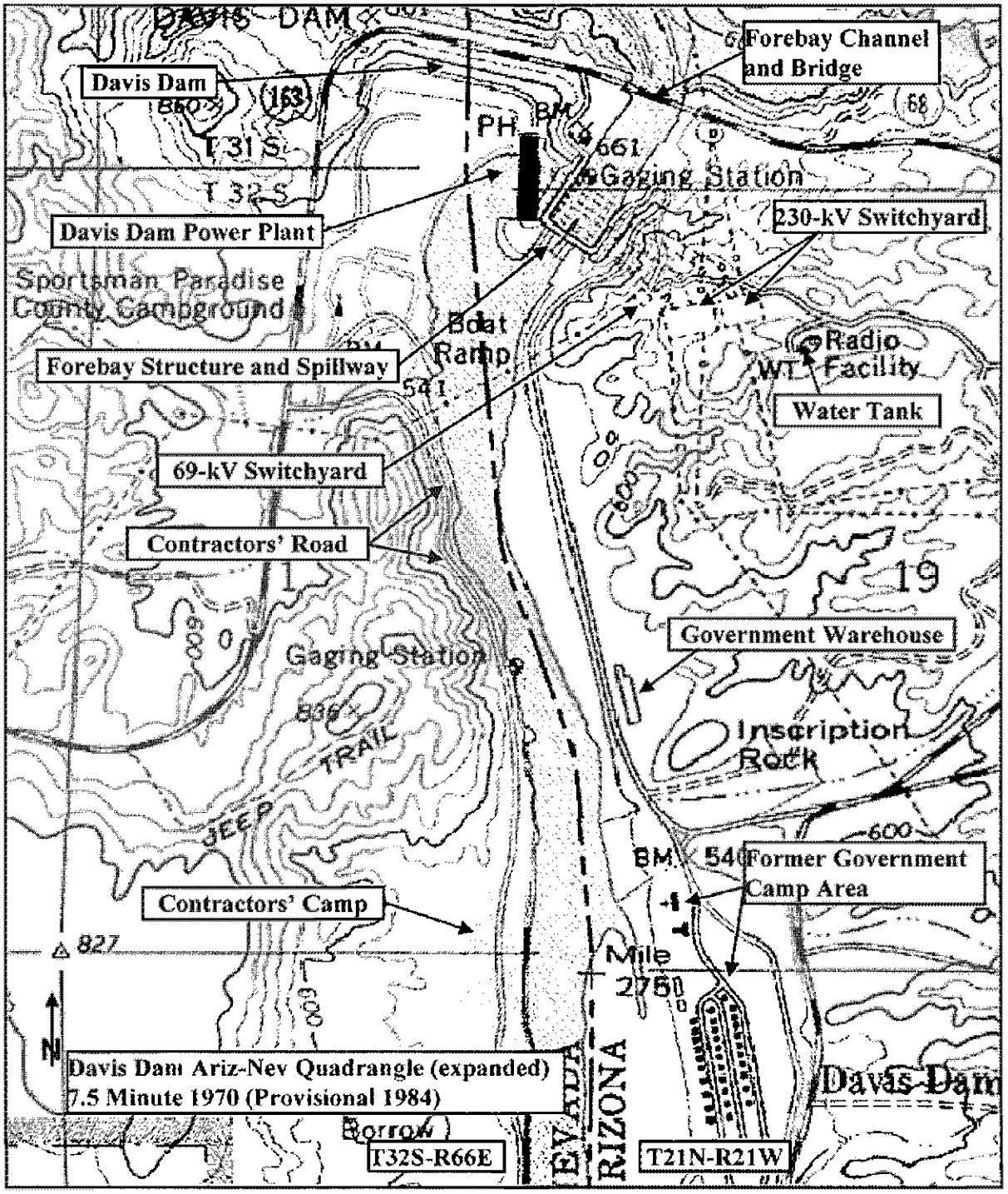
20 ACRE and HRA Conservation Archaeology, "Intensive Cultural Resource Inventory of Bureau of Reclamation Lands in the Vicinity of Davis Dam, Clark County, Nevada and Mohave County, Arizona," (2005).

Laughlin Chamber of Commerce. "Relocation." http://www.laughlinchamber.com. (accessed February 20, 2006).

Linenberger, Toni R. "The Parker-Davis Project (Third Draft)." Bureau of Reclamation History Program, Denver, Colorado, 1997.

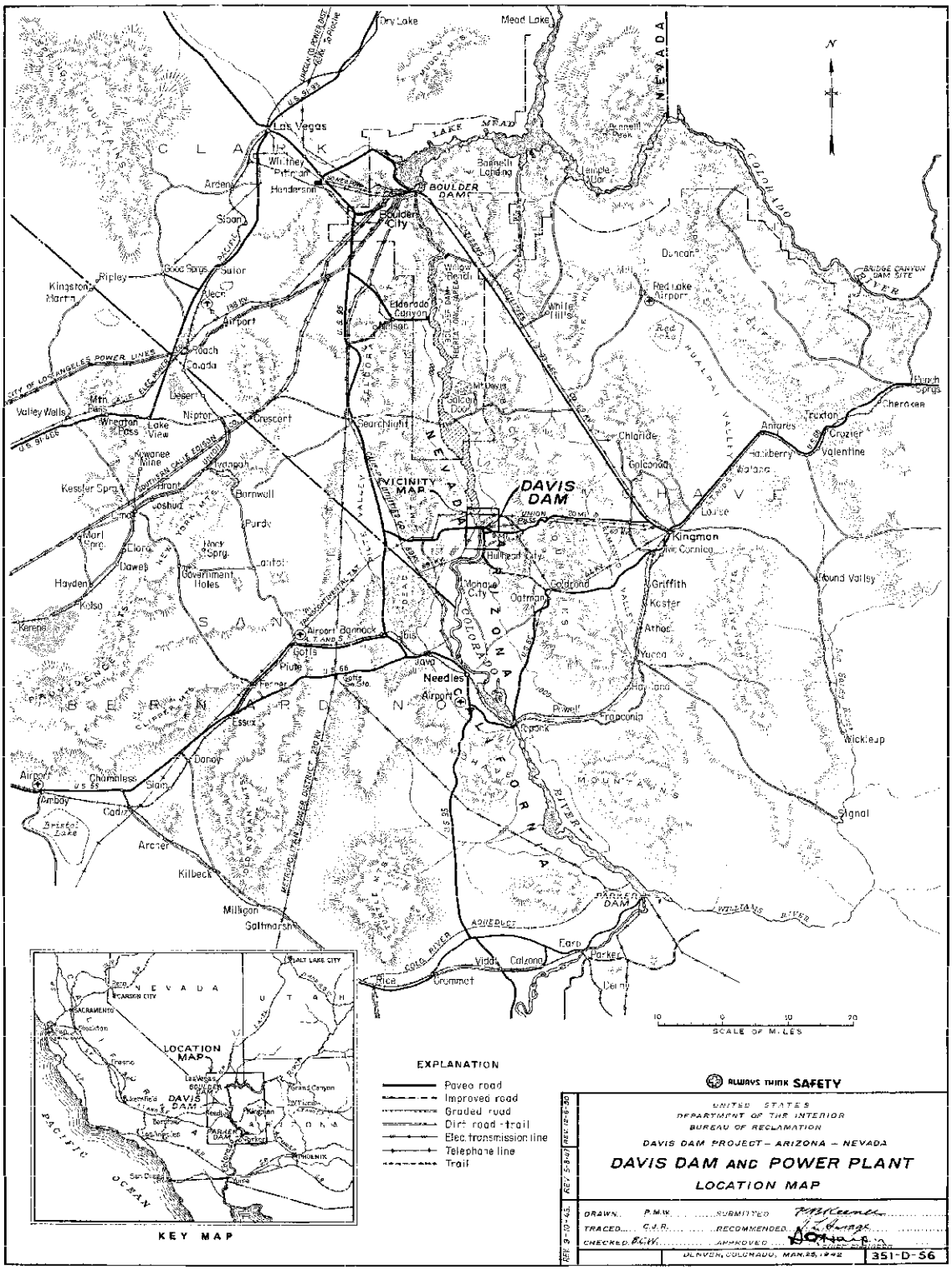
Lovejoy, Vernon. "Memorandum to George Wallen, regarding trip to Sportsman's Park, April 2, 1992." On file at Davis Dam, April 2, 1992.

Robert Autobee, interview by Bill Martin, January 28, 2003.



Davis Dam and Associated Structures

Locations of Key Features



Davis Dam and Power Plant Location Map (1942)
Drawing 351-D-56 (reduced), original drawing on file at Western Area Power Administration, Lakewood, Colorado